

Argus III System Upgrade Grant

Rob Holman
SECNAV/CNO Chair in Oceanography
COAS-OSU
104 Ocean Admin Bldg
Corvallis, OR 97331-5503
phone: (541) 737-2914 fax: (541) 737-2064 email: holman@coas.oregonstate.edu

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<http://cil-www.coas.oregonstate.edu:8080>

NOTE

This grant is for upgrades to the Argus Observing Program and primarily funds purchase of off-the-shelf components tested under a companion grant, Argus Development and Support, N00014-02-1-0146. Due to the nature of this grant (DURIP) and the substantial overlap with the Development grant, some of the content in this annual report is duplication of that for the Development grant.

LONG-TERM GOAL

The long-term goal of nearshore processes research has been to develop a predictive understanding of the fluid dynamics of a random wave field shoaling over the complicated bathymetry of a natural beach, and the response of the beach to those overlying wave and current motions. Due to the complexity and nonlinearities of the system, predictions at most time scales depend on frequent data updates, likely acquired through innovative remote sensing techniques. The Argus Program, developed by the Coastal Imaging Lab (CIL), is one such approach (<http://cil-www.coas.oregonstate.edu:8080>). Technology developments in Argus are important to a range of nearshore dynamics research programs and apply readily to other remote sensing programs of Naval interest.

OBJECTIVES

Argus is a global program, with 12 stations in 5 countries. While the program was invented at Oregon State University and we continue to be the intellectual lead, major complementary development programs have begun in Europe (Netherlands and England), the US (NRL-SSC) and Australia.

The precursors to Argus began in the early 1980's with the discovery that time exposure images of wave breaking could be used to locate and quantify the morphology of submerged sand bars and rip channels. This capability was automated beginning in 1992 with Argus I, then updated to a much more capable Unix platform in 1997. As techniques have become more demanding both better cameras and platforms have been needed. The objective of this work is to purchase equipment for the third generation of Argus, developed under the Argus Development grant, and to upgrade the stations in Argus network

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APPROACH

As this is a DURIP, the approach to this work is to simply buy the new equipment and use it to replace existing station (where appropriate)

WORK COMPLETED

The initial Argus III test station was deployed during the NCEX in the fall of 2003. Lessons from that deployment have lead to revisions and further testing. In the summer of 2004, a new station was installed at the Hinsdale Wave Lab at Oregon State University (the first laboratory installation of Argus). This installation has provided rigorous tests of the new system, in part because much higher sampling frequencies were required for the smaller-scale lab waves.

We have also partially transitioned our image processing algorithms from an older approach to photogrammetry to methods based on homogeneous coordinates [Hartley and Zisserman, 2003], that should offer many advantages and simplifications. For example, figure 1 shows a merged oblique image from the new Hinsdale Wave Lab Argus Station that is easily accomplished with homogeneous coordinates.

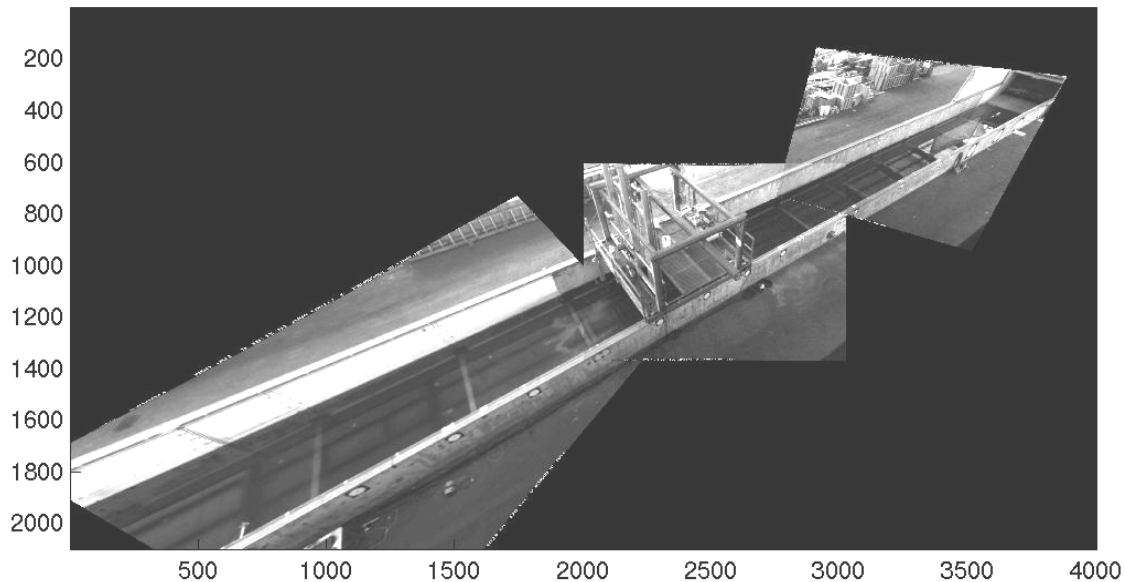


Figure 1. Merged oblique image of the Hinsdale Wave Lab. This image was created by projecting the views from each of the three station cameras into the projective geometry of the middle camera, a task simplified through the use of homogeneous coordinates.

In August, 2004, a further Argus III station was installed at Eglin Air Force Base in Florida. The next step will be an installation on the Oregon Coast.

IMPACT/APPLICATION

Argus has become increasingly important in Europe and Australia, with installations now in seven countries over three continents and serious Argus research in five countries. Approximately 35

stations are now in operation. Within the US, Argus and associated spin-offs will play a major role in the NCEX field experiment, now in progress. Argus is also an increasingly important part of Naval nearshore remote sensing research, for example in the VISSER program, run by Dr. Todd Holland at NRL-Stennis Space Center.

TRANSITIONS

Aspects of Argus research development have been integrated in Naval nearshore remote sensing programs through the PI's connections to the LRS program. Transition to the WSC of some of these results is ongoing or complete as of the time of writing.

RELATED PROJECTS

- 1 - Joint work with Dr. Todd Holland, NRL-SSC
- 2 – Collaboration with WSC personnel at Navocean (headed by Melody Bledsoe and Houston Costolo) on nearshore remote sensing
- 3 – LRS program collaboration
- 4 – EU CoastView Program (2002 – 2005)
- 5 – Numerous collaborations with the Field Research Facility
- 6 – Participation in the NCEX field experiment, 09/19/03 – 11/15/03
- 7 – Collaboration with the Ocean Engineering Group at OSU

REFERENCES

Hartley, R., and A. Zisserman, *Multiple view geometry in computer vision*, 665 pp., Cambridge University Press, 2003.

PUBLICATIONS

Holman, R.A. Stanley, J.A, and H.T. Özkan-Haller, The application of video sensor networks to the study of nearshore oceanography, *IEEE Journal of Pervasive Computing*, 2(4), 14-21, 2003.

PATENTS

None

HONORS/AWARDS/PRIZES

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